

# Sleep Apnea, Depression, and Sleep Problems: Inter-relationship in Patients with Severe Obstructive Sleep Apnea

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To the Editor,

Lee et al. reported the relationship between the severity of apnea and depressive symptoms in 302 male patients with severe obstructive sleep apnea (OSA) [1].

Depressive symptoms were evaluated by the Beck Depression Inventory (BDI), and several indicators of sleep were used to determine the mediational effect of sleep quality on the relationship between apnea and depressive symptoms. The authors used the apnea-hypopnea index (AHI) and respiratory distress index (RDI) to measure the apnea severity. Multiple linear regression analysis revealed a significant association between the BDI and the sleep problem index, sleep duration, and presence/absence of diabetes mellitus. In contrast, the RDI was not significantly associated with the BDI. Furthermore, the RDI was significantly associated with the sleep problem index, sleep duration, body mass index, and age. From these results obtained using the bootstrap procedure, it was concluded that the RDI and BDI were associated or mediated by sleep disturbance. I have a query on their study.

The authors used two indicators on the severity of apnea, and I suppose that these indicators are closely associated with a similar definition of apnea, except for respiratory effort-related arousal [2]. As the authors selected patients with severe obstructive sleep apnea, the lack of a significant association between the RDI and BDI may have been caused by their limiting the subjects to those with a high RDI.

Heinzer et al. reported that AHI in the highest quartile (>20.6 per hour) was significantly associated with hypertension, diabetes, metabolic syndrome, and depression [3]. They enrolled 2122 subjects (1024 men and 1098 women), and included subjects without severe obstructive sleep apnea. Lee et al. and Heinzer et al. conducted a cross-sectional study, and the causality of the association or the mediation effect could not be confirmed by a bootstrap procedure. I recommend conducting a follow-up study, and the effect of limiting the subjects to those with severe obstructive sleep apnea on the association between the RDI and BDI should also be considered in a further study.

**Compliance with Ethical Standard**

**Conflict of Interest** None.

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